CLAIMS

1. An optical control system comprising:

an azimuth rotator having an optical rotatory dispersion characteristic that changes optical rotation angle according to wavelength;

a spatial light modulator having an entrance surface capable of changing the optical rotation angle of the polarization plane of an incident light wave or an entrance surface having parts capable of individually changing the optical rotation angle of the polarization plane of an incident light wave; and

an analyzer;

wherein the azimuth rotator, the spatial light modulator and the analyzer are arranged so that an incident light wave containing a plurality of wavelength components passes the azimuth rotator, the spatial light modulator and the analyzer in that order,

the azimuth rotator transmits the incident linearly polarized light wave and gives optical rotation angles respectively to the wavelength components,

the linearly polarized light wave passed through the azimuth rotator is passed through the spatial light modulator with the entire entrance surface or with parts of the entrance surface having optical rotatory power corresponding to the optical rotation angle of one of the wavelength components,

the spatial light modulator adjusts the optical rotation angles of the polarization planes of the wavelength components so as to be in a predetermined relation with the direction of the analyzer, and

an outgoing light wave emerging from the analyzer contains wavelength components respectively having different spatial light intensities.

2. The optical control system according to claim 1 further comprising a polarizer disposed on the entrance side of the azimuth rotator,

wherein the polarizer converts an incident light wave containing a plurality of wavelength components, having an

optional polarization characteristic and fallen thereon into a linearly polarized light wave containing a plurality of wavelength components having the same polarization plane, and

the analyzer gives different spatial light intensities respectively to the wavelength components of the linearly polarized light wave received from the spatial light modulator.

3. The optical control system according to claim 1, wherein a surface perpendicular to the optical axis of the spatial light modulator are divided into a plurality of sections, and the sections of the spatial light modulator are capable of individually changing the optical rotation angle of the polarization plane of an incident light wave.

4. The optical control system according to claim 1, wherein the optical rotation angle of the spatial light modulator or optical rotation angle distribution in a near field pattern or a far field pattern is changed.

5. The optical control system according to claim 1, wherein the spatial light modulator is a twisted nematic liquid crystal.

6. The optical control system according to any one of claims 3 to 5, wherein the rotation angle for the polarization plane of the light wave passing through the spatial light modulator changes stepwise or continuously from the center of the spatial light modulator on the optical axis radially outward with distance from the center of the spatial light modulator in an axisymmetric rotation angle distribution.

7. The optical control system according to claim 1, wherein a spatial phase modulating operation caused by the control of spatial light intensity distribution by the spatial light modulator is adjusted.

8. An optical control system comprising:

an azimuth rotator having an optical rotatory dispersion characteristic that changes optical rotation angle according to wavelength; and

a spatial optical phase modulator having an entrance surface capable of controlling the wave surface of an incident

light wave or an entrance surface having parts capable of individually controlling the wave surface of an incident light wave to adjust the spatial phase distribution of the incident light wave;

wherein the incident light wave passes the azimuth rotator and the spatial optical phase modulator in that order,

the azimuth rotator transmits an incident linearly polarized light wave containing a plurality of wavelength components and gives optical rotation angles respectively to the wavelength components,

the linearly polarized light wave passed through the azimuth rotator is passed through the spatial optical phase modulator with an entrance surface having an spatial optical phase modulation degree or with an entrance surface having parts adjusted respectively to spatial optical phase modulation degrees,

the spatial optical phase modulator produces an outgoing light wave having adjusted ratios of light quantities subject to spatial optical phase modulation for the wavelength components, and

the wavelength components form different far field patterns, respectively.

9. The optical control system according to claim 8, wherein the spatial optical phase modulator is a two-dimensional optical phase modulator that modulates the phase of only a polarized light component polarized in a direction parallel to one of two perpendicularly intersecting coordinate axes defining a plane perpendicular to the optical axis of the incident light wave.

10. The optical control system according to claim 8, wherein the spatial optical phase modulator is a parallel oriented nematic liquid crystal spatial light modulator.

11, The optical control system according to claim 8, wherein the azimuth rotator gives different polarization angles respectively to the polarized wavelength components of the incident light wave by using an optically rotatory dispersion

effect to emit a light wave having different ratios between two polarized components distributed along perpendicularly intersecting reference coordinate axes contained in a plane perpendicular to the optical axis for the wavelength components, and

the spatial optical phase modulator receives the light wave emerging from the azimuth rotator and emits an outgoing light wave having an adjusted ratio between polarized components undergone spatial phase modulation and having light surfaces having shaped spatial shape and polarized components not undergone spatial phase modulation and having wave surfaces having unchanged spatial shapes.

12. The optical control system according to claim 1 or 8, wherein the spatial phase modulating action of the spatial light modulator forms a spiral spatial optical phase distribution in the outgoing light wave and a phase shift for one full turn about the optical axis is approximately equal to an integral multiple of 2π rad.

13. The optical control system according to claim 1 or 8 further comprising a wavelength phase modulator capable of adjusting the respective optical phases of the wavelength components.

14. The optical control system according to claim 13, wherein the adjusting operation of the wavelength phase modulator for the adjustment of the optical phases of the wavelength components is performed simultaneously with the adjusting operation the azimuth rotator, the spatial light modulator or the spatial optical phase modulator to control the phases, and the spatial light intensity distributions or spatial optical phase distributions of the wavelength components of the outgoing light wave simultaneously.

15. The optical control system according to claim 1 or 8, wherein the azimuth rotator is a Faraday rotator.

16. The optical control system according to claim 1 or 8, wherein the azimuth rotator is an optical device made of a natural optical rotatory material.

17. The optical control system according to claim 1 or 8, wherein the azimuth rotator is an optical device made of a liquid crystal.

18. The optical control system according to claim 1 or 8, wherein the optical rotatory dispersion angle of a light wave passed through the azimuth rotator is 90° at a maximum.

19. The optical control system according to claim 1 or 8, wherein the effect of combination of the plurality of wavelength components of the outgoing light wave respectively having different spatial distributions is applied to various process control purposes.

20. The optical control system according to claim 19 wherein the laser plasma x-ray generating rate of a laser plasma x-ray generator is controlled by making the leading end of a light pulse first arriving at a target of the laser plasma x-ray generator have a spatial light intensity distribution concentrating energy on a central part of the optical axis, and by making a series of light pulses subsequently reaching the target have annular spatial distributions having a central part of a low light intensity and a peripheral part of a high light intensity.

21. The optical control system according to claim 19, wherein a wavelength component of the same wavelength as a fluorescent light wave in a broad-band spectrum is used for fluorescence suppression, and wavelength components of other wavelengths are used as fluorescence excitation light waves in an ultrahigh-resolution scanning fluorescence microscope of a STED system.

22. An optical control method comprising the steps of:

making a linearly polarized light wave containing a plurality of wavelength components fall on an azimuth rotator having an optical rotatory dispersion characteristic to determine different polarization angles for the wavelength components, respectively, to give different polarization angles respectively to the wavelength components;

passing the linearly polarized light wave passed through

the azimuth rotator through a spatial light modulator to give an optical rotation angle to an entrance surface or optical rotation angles to parts of an entrance surface; and

passing the linearly polarized light wave passed through the spatial light modulator through an analyzer to emit an outgoing light wave containing wavelength components respectively having controlled spatial light intensity distributions.

23. An optical control method comprising the steps of:

making a linearly polarized light wave containing a plurality of wavelength components fall on an azimuth rotator having an optical rotatory dispersion characteristic to give different polarization angles respectively to the wavelength components;

passing the linearly polarized light wave passed through the azimuth rotator through a spatial optical phase modulator to change the spatial optical phase of the incident light wave on an entrance surface or the spatial optical phases of the incident light wave on parts of an entrance surface; and

emitting an outgoing light wave containing wavelength components having controlled spatial light intensity distributions.

24. The optical control method according to claim 22 or 23 further comprising the step of adjusting the respective optical phases of the wavelength components by a wavelength phase modulator.

25. The optical control method according to claim 24, wherein spatial optical phase distributions are simultaneously controlled.

26. The optical control method according to claim 24, the adjustment of the respective optical phases of the wavelength components by the wavelength phase modulator is carried out simultaneously with the adjustment of the spatial light intensity by the azimuth rotator, the spatial light modulator or the spatial optical phase modulator to control the phases of the wavelength components of the outgoing light wave, and the

spatial light intensity distribution or the spatial optical phase distribution of the outgoing light wave simultaneously.